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ON DIET THERAPY IN ATHEROSCLEROSIS

-USSR-

By F. K. Men'shikov

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ON DIET THERAPY IN ATHEROSCLEROSIS

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[Following is the translation of an article by Prof F. K. Men'shikov of the Chair of Dietotherapy, which he heads, of the Central Institute of the Advanced Training of Physicians (M. D. Kovrigin, Director) in Sovetskaya Meditsina (Soviet Medicine), No 8, Moscow, 1960, pages 30-39.]

The observations of morphologists, clinicians, biochemists, researchers, and dieticians are utilized in diet formation for those afflicted with atherosclerosis. Virchow (1856) detected the crystals of cholesterol in atheromatous substances; Aschoff (1904) and Adami (1906) showed that these substances are related to the fatty acid esters of cholesterol. They thereby also attracted attention to the study of fat metabolism in atherosclerosis.

The experimental data of A. I. Ignatovskiy and L. M. Starokadomskiy (1906) pointed out the deposit of atheromatous substances in the blood vessels of domestic rabbits which were on a carniverous diet. N. V. Stukkey (1910) detected the deposit of atheromatous substances in the vessels of domestic rabbits which had been fed egg-yolks; the experimental work of N. N. Anichkov (1912) and other morphologists (V. D. Tsinzerling, 1950, and K. G. Volkova, 1953) in laying down the principles of the pathogenesis of atherosclerosis also has special significance.

The importance of the alimentary factor in the origin and development of atherosclerosis has been brought out by the numerous statistical data obtained by observing the populations of various countries; these observations were made with the purpose of determining the dependence of atherosclerosis on the character of nutrition, especially on the fat requirements, and partly on the cholesterol content in foods. Keys (1954) considers the increased fat content in food the main etiological factor in causing atherosclerosis. Stamler (1957) has shown that there are fewer atherosclerosis cases in such countries as Italy and Japan than there are in the United States because of a lower protein, fat, and cholesterol requirement. Especially interesting data were published at the International Congress on Gastroenterology and Nutrition in 1959 by Reynish, Zoulek, Mesh'tyan, Grabane, and Conrad: among populations requiring high-caloric fat (35 percent general caloric content) the

content of cholesterol and phospholipids in the blood and also the lethalness of thromboembolic diseases is significantly higher than among populations which require primarily vegatble oil (caloric content of fat, 10 percent). They also pointed out the more frequently encountered hypercholesterol condition with an alteration of the blood vessels in people who consumed high-caloric, fatty foods, especially in people engaged in mental work.

In regard to people who move to another country and alter their nutrition through significant increases in fat consumption, the biochemical indices for lipid exchange approximate the amounts indicated for the local population at the end of the second year (Reynish, Zoulek, and others).

The adaptability of the organism in regard to regulating fat metabolism is especially well shown in the Eskimoes who require a 54 percent fat diet and who are seldom afflicted with either atherosclerosis or coronary deficiency.

Clinicians and biochemists have uncovered facts which allow us more deeply to understand the pathogenesis of the disease. For example, it was established that hypercholesterolemia is detected in not all atherosclerotics (David, Eddi, 1957), that an increased content of not only cholesterol but also neutral fat and phospholipids has been detected in the blood in which the rate of growth of the cholesterol lags behind the growth of the phospholipids and the index of the ratio of lecithin to cholesterol is decreased (V. B. Il'inskiy, A. B. Shakhnazarov, S. L. Gol'tskener, M. B. Bavina, Yu. T. Pushkar', and others). Then it was shown that not only cholesterol but also protein-cholesterol particles infiltrated the outer tunica of the arteries; here the ratio of the , , and -globulins as well as the size of the particles have a definite significance (Gofman, 1950). Earlier, especially during the war, it was established that the process of infiltration is reversible and that its reversibility is also connected with the alimentary factor (N. N. Anichkov, K. G. Volkova, 1953; V. D. Tsinzerling, 1951; M. A. Zakhar'yevskaya, B. I. Monastyrskaya, 1950, and others).

In connection with the fact that atherosclerosis is a metabolic-vascular disease, scientists began to study the vascular wall, its elasticity, permeability, etc. It was discovered that cholesterol enters the vascular wall from the blood stream; here the lipolytic activity of the vessels as well as their tonus have definite significance. The lipolytic activity in adult rats is higher and decreases towards old age and is lower in herbivorous than in omnivorous animals.

Zempleni (1959) stated that in the atherosclerotically altered aorta, the ratio between cholesterol and phospholipids is disrupted in favor of an increase in cholesterol, and that cerebrocides and sphingomyelin are also accumulated, whereas these substances do not accumulate in the blood plasma; this, in the opinion of Heyrovsky (1959), shows the active role of the vascular wall in regard to lipids. All this confirms the importance of the walls of the blood vessels in the deposition of atheromatous masses. It is necessary to reveal the factors which exert

a negative influence on the permeability and elasticity of the endothelium and also to focus attention on providing the organism with those substances which are related to the regeneration of the amorphous conglutinant, such as ascorbic acid and vitamin P.

On the basis of experimental data and clinical and laboratory research, physicians have begun strongly to recommend nutrition with fat and cholesterol limitations. B. V. Il'inskiy, Van Handel, Neumann, Bloom, Sala and Marco, Barnes, Lindquist, Isaksson, Meiner, Walker, and many others recommend a maximum limitation to fat in diets and to completely exclude food substances containing cholesterol; diets are thereby changed into one-sided, incomplete form of nutrition which condemns patients to partial starvation. B. V. Il'inskiy (1956), Morrison (1951), Sala, Marco (1957), and Barnes (1959) suggest a diet with a fat limitation up to 20-25 grams with a complete exclusion of substances containing cholesterol. Van Handel, Neumann, and Bloom (1957) have recommended a 20 gram fat diet, with a supplementary introduction of soybean lecithin, soybean meal, and soybean oil.

Lindquist, Isaksson (1956), and Gaferkamp (1957) have focused special attention on fat and cholesterol limitation, and Weiner, Walker, and Milch (1954) allow atherosclerotics who have a myocardial infarct to use up to 50 grams of fat with normal caloric value. Kralova and Fialowa (1959) at the Congress of Gastroentherology and Nutrition in 1959 reported on the effectiveness of diets with a restricted caloric content (1,000 large calories) at the expense of fat (30-35 grams). Mikol (1957) recommends using a sufficient amount of vitamin A, riboflavin, vitamin C, and group P vitamins and to limit compulsorily vitamin D even up to its complete exclusion.

Sinisterra and Stare (1957), having substituted animal fats in the diet with vegetable oil, detected a lowering of cholesterol in the plasma, and an improvement of the general condition of those suffering from angina pectoris.

The use of diets with sharply limited amounts of fat and with cholesterol excluded is of value for short periods of time but atherosclerosis is a generally chronic metabolic-vascular disease, and for this reason, a diet must be prescribed over a long period of time. This means that the diet must have its full value, and must be formed according to the latest achievements in the area of atherosclerosis study. The diet for atherosclerotics must contain a normal amount of protein and carbohydrate with a reduced limitation of calorific value at the expense of fats, rich cholesterol and vitamin D, and with an increased content of methionine, choline, and unsaturated fatty acids. Linoleic acid content in various oils is as follows: hempseed oil, 68.8 percent; sunflower seed oil, 68 percent; cottonseed oil, 50.4 percent; linseed, rapeseed, and peanut oil, 29-30 percent; the oil of walnuts, 75.5 percent; in soybean oil, 58.8 percent, in olive oil, 15 percent; in margarine, 4.6 percent; in butter, about 4 percent; in beef fat, 5.3 percent; in chicken fat, 21.3 percent. Methionine is found in the following amounts: in mutton, 6.5 grams per one kilogram; in soybeans, 9.27 percent; in curds,

4.9 grams; in beef, 4.47 grams; in pike and codfish, 3.5-3.9 grams; in beans, peas, buckwheat, rice, wheat and rye meal, 4.4-1.7 grams; the 24-hour requirement is about 1.5-2 grams. Choline is found in egg-yolk and brains (where much cholesterol is also found) and in a large quantity in beef liver. There is no cholesterol in leguminous plants but they contain much choline (in soybeans, 3.4 milligrams; in peas, 2.65 milligrams, spinach and cabbage, 2.4-2.5 milligrams; in veal, in powdered milk, asparagus, barley, dehydrated potatoes, 1-1.67 milligrams; in dehydrated carrots, turnips, wheat, oats, polished rice, from 0.8 to 0.9 milligrams per one kilogram of product).

There must also be in the diet an increased content of substances which have a lipotropic effect, ascorbic acid, vitamin P, and a sufficient amount of thiamin, riboflavin, and pyridoxine.

A limitation on the caloric content is necessary because frequently the metabolic processes and the function of the thyroid gland are lowered in persons afflicted with atherosclerosis (A. P. Nesterova, K. M. Prostyakov, E. G. Paramonova, 1957, and others); food with a high caloric content owing to fat favors the development of atherosclerosis (D. M. Grotel', 1930; Ye. Ye. Bykhovskaya, 1940; M. M. Pavlova, M. G. Pokhodilova, V. G. Shor), and nutrition insufficient in caloric content involves an involution in atheromatous plaques and areas of adiposity (K. G. Volkova, 1953). A vitamin D limitation is substantiated by experimental data which have shown that under its influence the cholesterol content is regularly increased in domestic rabbits, the lecithin-cholesterol characteristic is lowered and atherosclerosis develops earlier (M. V. Bavina, 1951). Under the influence of ascorbic acid the cholesterol content is regularly decreased and the deposition of atheromatous masses is inhibited (I. A. Myasnikova and L. A. Tyapina, 1953). An increased amount of cellulose is necessary because, under the influence of vegetable food with a large amount cellulose, the evacuation of cholesterol with fecal masses is increased (S. B. Barskiy, 1946). A large amount of lecithin and choline are necessary because lecithin inhibits the development of atheromatosis (Kanoch, Laszlo, Perlzveig, 1935), and the lecithin-cholesterol characteristic increases in people under the influence of cerebrolecithin. (A. A. Kleopina, 1956); choline stimulates the formation of phospholipids and lowers the content of cholesterol in the blood, inositol and pyridoxine stimulate the lipotropic action of choline and also promote the conversion of linoleic acid into arachidonic acid (May, 1956). Soybean phosphatides are rich in choline and inositol; as is known, they inhibit adiposis of the liver. Betaine and methionine are the precursors of the formation of choline in the organism, i.e., they are also related to the lipotropic factors but are less active than choline.

In the diet there must be a sufficient amount of full-value proteins. It is known that lipids in the blood are found in combination with globulins; in healthy people the largest part of the cholesterol is retained in solution in the form of lipoprotein complexes consisting of protein, cholesterol, the esters of cholesterol, and phosphatides. The -lipoproteins contain 75 percent of the total cholesterol, and in atherosclerosis

relatively little cholesterol is combined with the -globulins but more than one-fourth combines with the -globulins. In experimental atherosclerosis an increased complex formation of -globulins with lipids occurs, and the concentration of albumins with the accumulation of and -globulins decreases (M. V. Bavina, 1951). A sufficient quantity of riboflavin and pyridoxine is necessary in introducing a sufficient quantity of proteins because riboflavin aids the decomposition of food proteins into unspecified products and their synthesis into specific products, and also aids the acidifying deaminization of amino acids. Cystine, tyrosine, tryptophan, histidine, and glycine are not assimilated in the absence of riboflavin; they become toxic and are expelled with the urine in an unaltered form. In addition, it is necessary to provide the organism with a sufficient quantity of pyridoxine, as its absence disrupts the transaminization, decarboxylization, and deaminization of amino acids and decreases the activity of the transaminase; besides pyridoxine takes part in the exchange of methionine, tryptophan, and cystine, thus the more amino acids are introduced, the more pyridoxine is required.

In designating a diet the thinking of the physician at the patient's bedside is directed toward limiting or forbiding this or that substance, which sometimes is insufficiently founded. In designating a diet for an atherosclerotic patient the amount of fat is limited and substances rich in cholesterol and vitamin D are excluded, this brings us to a short examination of the biological importance of these substances.

The complete exclusion of fat from a person's nourishment is not practically feasible and moreover is not advisable because, although the cholesterol content is lowered, it leads to a sharp accumulation of fat in the liver and increases the fragility and permeability of the vascular walls and lowers their elasticity (Kramar, Kowatsch, 1959). In addition, fat aids the assimilation of proteins, inhibits their expenditure during starvation and controls the content of vitamin B1 (Iwans, Lopkowky, 1957): thiamin participates in the transanimization of amino acids (A. Ye. Braunshteyn, M. G. Kritsman, D. L. Ferdman, S. F. Epshteyn) and in the conversion of pyruvic acid into alanine and glutamic acid into -ketoglutaric acid. In a fatless diet the vitamin F content falls and the regeneration of tissues is inhibited due to an absence of material for forming the cellular membranes (Besnayake, Sinclair, 1956). In introducing fats into a diet the requirement for pyridoxine is decreased; the less fat in the food, the more pyridoxine is required (Sinclair, 1951). In a fatless diet and in the absence of pyridoxine a fat infiltration of the liver takes place and in a shortage of pyridoxine the neutral fat content in the liver is decreased. In addition, under a complete deprivation of fat, we deprive organisms of the possibility of obtaining unsaturated fatty acids, which have a lipotropic activity.

Linoleic and linolenic acids in the organism are not synthesized and for this reason must be introduced in the food; these acids are converted into arachidonic acid which has a lipotropic effect; in their absence in the livers of animals, cholesterol is deposited in the form

of esters which are insoluble in fats. Unsaturated fatty acids aid the admission of the cholesterol into the plasma and its elimination from the organism (Chum, 1957). Cholesterol in esterification with saturated fatty acids is eliminated from the organism with great difficulty and this fact may aid its precipitation in the outer tunica of the blood vessels. Moreover saturated fatty acids have an antivitamin effect in regard to group B vitamins. Linoleic acid is the precursor of arachidonic acid (Turpeinen, 1956) and converts into arachidonic acid in the presence of pyridoxine (Sinclair, 1952) but loses its lipotropic effect in rancid butter (Schneider, 1953).

Many data indicate an increased coagulability of the blood from fats of all types (Donner, 1950); phospholipids retained in blood plasma may also aid the formation of thrombi in blood vessels. The coagulability of blood is also increased by introducing one of the fractions of phosphatides separated from butter (Bellimoris, Maklegon, 1958). Lecithin has lipotropic activity and aids the emulsification of fat while choline, being a component of lecithin, promotes the formation of phospholipids (Tidwel/1/, 1956).

All these data and many others indicate that fats should not be entirely excluded but only limited, however it is necessary to introduce fat rich in lecithin and unsaturated fatty acids.

The exclusion of substances rich in cholesterol from foods is recommended in forming diets for atherosclerotic patients. Much cholesterol is contained in fish fat (5,700 milligrams per 100 grams), in eggyok and calf brains (1,500-1,800 milligrams), animal livers (310-340 milligrams), butter (244 milligrams), margarine (186 milligrams), in mutton and beef fat (100-125 milligrams), in herring, beef, veal, and codfish (70-100 milligrams), and in pork and salmon (60 milligrams) per 100 grams of product. Cholesterol and phospholipids in plasma are found in the form of mixed protein compounds in which about 90 percent of the lipoproteins consist of free cholesterol, the esters of cholesterol, neutral fat, phospholipids and proteins. The lipoproteins of the plasma differ in volume and density; especially large molecules appear in people after myocardial infarct (Gofman, 1950). The exclusion from foods of fat and cholesterol leads to a decrease of these large molecules in plasma, but Keys, Kroller, and Chiel dispute the connection of atherosclerosis with the presence of gigantic molecules and question the fact that cholesterol aids their formation. Cholesterol is a necessary element in food; it is necessary for the formation of cholic acids, the synthesis of hormones of the adrenal glands, and gonads, and is the precursor of provitamin D. For this reason it is necessary to limit it and not exclude it in breaking down cholesterol metabolism. Vegetable fats can also aid the formation of cholesterol from acetates, and the latter may be formed from proteins and carbohydrates.

Choline, lecithin, methionine, vitamin C, ginseng, rosemary, and the leaves and flowers of the hawthorn act as substances which lower cholesterol content: sitosterol inhibits its absorption in the intestine "Weis, 1956). The following vitamins participate indirectly in lowering

cholesterol content: vitamin E, which guards against acidification of highly saturated fatty acids inside the organism, and vitamin A in conjunction with vitamin E tocopherol.

The limiting of vitamin D in the diet for atherosclerotics is considered generally acceptable; this is based on observations of increased cholesterol and a more intensive deposit of atheromatous masses in herbivorous animals under the influence of injected vitamin D_2.

By vitamin D at the present time is understood about 10 fractions but under conditions of practical activity the limitation of vitamin D_1 is implied, which is a compound of vitamins D_2 and D_3.

Vitamin D_2 - calciferol - is synthesized in products made of ergosterol under the influence of a quartz lamp exposure while vitamin D is formed in the skin from 7-dehydrocholesterol under ultraviolet exposure. This means that the organism is provided with vitamin D owing to its introduction from without with food and its synthesis in the organism. Vitamin D has a direct relationship to mineral exchange: it aids the absorption in the intestines of calcium and phosphorous and their assimilation by the cells. Vitamin D participates in the activity of the intracellular oxidizing systems, raises the metabolism in the cells, retards the phosphatase in the skeleton, aids the formation of antibodies and increases the ability of the blood to destroy bacteria. Besides participating in bone formation, it acts as a desensitizer for nettle rash and hay fever, and has a relationship to iodine content, i.e., it is necessary for normal metabolic processes. For this reason, although vitamin D is synthesized in the organism, its sharp limitation in food is not justified over a long period of time.

Vitamin B_{12} also has a lipotropic effect. It influences the synthesis of phosphatides and cerebrocides; under its influence also the fatty bone marrow is replaced with active red marrow, and the fat content in the liver is lowered.

We must mention manganese, copper, and cobalt of the microelements. Managanese is the activator of the oxidation processes in the animal organism. Similar to choline, it raises the intensity of fat utilization in the organism, inhibits fat deposits, and aids the deposition of glycogen in the liver. Copper is also a good oxidizer. It assists the utilization of carbohydrates, accelerates the process of oxidation of glucose, inhibits the decompostion of glycogen and aids in its accumulation.

The following foods are recommended for atherosclerotic patients: vegetable, groats, and milk dishes, meat without fat, types of fish without fat, especially dishes made from curds, buckwheat groats, legumes, dishes of codfish and pike, and also products rich in methionine, choline, ascorbic acid, cellular tissue, and laxative food substances. Meat and fish broths, animal fat, fatty meat and fish are to be limited; it is recommended that animal fat be replaced when possible by vegetable fat. Strong tea and strong coffee must not be used. Salted and pickled foods must be limited, and substances rich in cholesterol and vitamin D must

be prohibited -- egg-yoks, fish fat, brains, fatty meat, fatty fish, fatty creams, shortening, cream, and alcoholic beverages (see the following menu).

Sample Menu for Atherosclerotic Patients

First Day

First breakfast	Herring, carefully soaked, with a boiled potato (herring, 100 grams, potato, 150 grams). Manna gruel (manna groats, 25 grams, milk, 75 milligrams, sugar and butter, 2.5 grams each). Tea with milk (milk, 50 milligrams). White bread, 50 grams.
Second breakfast	Rose water with 5 grams of sugar.
Dinner	Compote made of fresh apples and dried apricots (apples and apricots, 45 grams each, sugar and rice, 20 grams each, potato meal, 10 grams). Ragout of boiled meat with vegetables (meat, 125 grams, potato, 100 grams, carrots, 40 grams, greens and tomato, 10 grams each, milk, 40 milligrams, sour cream, 15 grams, flour and oil, 5 grams each). Lemon gelatin (one-fourth of a lemon, gelatin, 3 grams, sugar, 20 grams).
Supper	Pudding made of curds (curds, 50 grams, milk and sugar, 20 grams each, manna groats and meal, 5 grams each, butter, 2.5 grams, one-eight of an egg). Cabbage schnitzel (cabbage, 200 grams, milk, 20 grams, manna groats, 15 grams, meal, 3 grams, butter, 5 grams, sour cream, 10 grams). Coffee (without caffeine) with milk (milk, 50 milligrams).
At night	Prunes, 50 grams.
(For the (entire day	White and bran bread, 100 grams each.
(Total for (the diet	Proteins, 87 grams, fats, 59.5 grams, carbohydrates, 374 grams, caloric content, 2,400 large calories.

Second Day

First breakfast	Vegetable salad with meat (meat, 70 grams, potato, 50 grams, sour cream, green salad and apples, 20 grams each, fresh cucumbers, 40 grams, small green peas, 30 grams, green onions, 10 grams, vinegar, 5 milligrams).

	Buckwheat gruel (buckwheat groats, 40 grams, butter, 5 grams). Coffee (without caffeine) with milk (milk, 50 milligrams)
Second breakfast	An apple, rose water with 5 grams of sugar and 50 grams of biscuit or bread.
Dinner	Vegetarian borsch, half a plate (potatoes and cabbage, 25 grams each, beets, 40 grams, carrots and sour cream, 10 grams each, butter, tomato, greens, and onion, 5 grams each, flour and sugar, 2.5 grams each) Beef Stroganov made of boiled meat with a boiled potato (meat, 125 grams, potato, 150 grams, milk, 40 milligrams, greens and sour cream, 10 grams each, flour and oil, 5 grams each). Compote made of apples (apples, 90 grams, sugar, 20 grams).
Supper	Lapshevnik [meat loaf] with curds, half a portion (curds, meal and milk, 25 grams each, one-fourth of an egg, butter and sour cream, 2.5 grams each, sugar, 5 grams). Carrot rissole [bitochki] with apples, well baked (carrots, 150 grams, apples and sour cream, 50 grams each, manna groats, 15 grams, butter, sugar, and flour, 5 grams each). Weak tea with milk (milk, 50 milligrams)
At night (For the (entire day	A glass of curdled milk. White and black bread, 100 grams each.
(Total for (the diet	Proteins, 76 grams, fats, 61 grams, carbohydrates, 368 grams, caloric content, 2,416 large calories. Note: If a raising of the caloric content is desirable, add white bread, 100 grams, bran or black bread, 50 grams, soup to a full dish and sugar, 10 grams; this will increase the caloric content to 2,950 large calories (proteins, 87 grams, fats, 70 grams, carbohydrates, 432 grams).

Third Day

First breakfast	Oat gruel (oat groats, 50 grams, milk, 150 milligrams, butter and sugar, 5 grams each). A meat dish (meat, 60 grams, oil, 5 grams). One glass of tea with milk (milk, 50 milligrams)
Second breakfast	A glass of rose water or carrot jice with 50-60 grams of bread.

Dinner	Vegetarian sour cabbage soup, half a portion (cabbage, 50 grams, carrots and tomatoes, 10 grams each, potato, 25 grams, butter, 5 grams, sour cream, 4 grams) Boiled meat with miscellaneous trimmings under a white sauce (meat, 125 grams, potato, 60 grams, carrots, small green peas and summer squash, 30 grams each, milk, 50 milligrams, butter, 5 grams, flour 3 grams). Compote made of apples (apples, 90 grams, sugar, 20 grams).
Supper	Pudding made of curds (curds, 100 grams, manna groats, and white flour, 5 grams each, milk, 15 milligrams, sugar, 10 grams, oil, 3 grams, one-eight of an egg). Cabbage roll, stuffed with vegetables (cabbage, 150 grams, carrots, 50 grams, turnips, 20 grams, parsley, 15 grams, tomato, 10 grams, greens, 5 grams, flour, 5 grams, sour cream, 20 grams, one-fourth of an egg, butter, 5 grams, milk, 50 milligrams).
At night	Prunes, 50 grams.
(For the (entire day	White or bran bread, 100 grams, black bread, 100 grams.
(Total for (the diet	Proteins, 79.2 grams, fats, 64.3 grams, carbohydrates, 355 grams, caloric content, 2,267 large calories.

With myocardial infarct, substance which aid the coagulation of blood, retard the evacuation of the intestines, and increase the fermentive processes and bloating of the intestines are excluded in the foods.

The first two to three days the patient is permitted only liquid food without salt, warm, and in small portions, a sugar solution, preferably glucose, tea with milk and sugar, tincture of dog rose, a decoction of black currants, carrot and beet juices, and cranberry water.

On the third to fourth days a diet is prescribed with a caloric content up to 900-1,000 large calories with a protein content to 50-60 grams, fat content to 20-25 grams, and carbohydrates up to 120-140 grams; the patient is given biscuits made of white bread to 60 grams, sugar, 50-60 grams, butter, 15 grams, milk, two to two and one-half glasses, vegetable, milk, and fruit soups, fish, meat, chicken, rabbit in boiled form, quenelles, fatless curds with sugar, manna and buckwheat gruels, gelatin desserts, fruit jellys, fruit and vegetable juices.

From the second week of the illness a diet is prescribed with a caloric content of 1,200-1,400 large calories: 65-70 grams of protein, 30-35 grams of fat, and 190-210 grams of carbohydrates. The food is prepared in a strained form, without salt, and in fractional portions; 100-120 grams of biscuit, 50-60 grams of sugar and up to 30 grams of butter are permitted.

In the fourth week a diet is allowed with a caloric content of

1,600-1,800 large calories, protein content, 70-80 grams, fat content, 40-55 grams, and carbohydrate content, 220-240 grams. In a 24-hour period are permitted 150 grams of dry white bread, 50-60 grams of sugar, 30 grams of butter, various soups, fatless meat in a strained form, boiled fish, groat and curd dishes, and also various sweet dishes.

In the sixth and seventh week a diet is provided with a caloric content up to 2,000-2,200 large calories, containing up to 100 grams of protein, 50 grams of fat, and 250-300 grams of carbohydrates. The following are permitted: 150 grams of white bread, 50-60 grams of sugar, all types of soups (even soup with quenelles), fatless beef, veal, a piece of chicken, boiled fish, an omelette of egg whites, carrots, cauliflower, lettuce, cucumbers, green peas; then the patient is transferred to the diet prescribed for atherosclerotics (see table).

Thus the diet of an atherosclerosis patient must be an obligatory method of complex therapy in which the nutrition must have full value and not be one-sided.

The basic diet must be moderately limited in calorific value at the expense of fat rich in cholesterol and vitamin D, and must include fats rich in unsaturated fatty acids and lecithin. There must be in the diet a sufficient amount of full-value proteins (choline, irreplaceable amino acids, and in particular methionine must be present in them), and carbohydrates, predominantly owing to vegetables, fruits, legumes, buckwheat and oat groats. The ascorbic acid content must be increased, and a sufficient quantity of riboflavin, pyridoxine, thiamin, and vitamin B_{12}, and folic acid is necessary.

Patients are not recommended to consume substances which cause bloating of the intestines and constipation; persons inclined to obesity and who are obese must limit the calorific content of their food and must establish light diet days i.e., days on which they eat only curds with milk, and apples (up to 1,500 grams), fresh cucumbers (up to 1,500-2,000 grams), etc.

The diet for myocardial infarct patients is formed on the same principle but with different caloric content depending on the composition.

Dietotherapy Therapy for Atherosclerotic and Myocardial Infarct Patients

	Large calorie quantity	Proteins	Fats (in grams)	Carbohydrates	Vitamins (in milligrams)						
					A	B_1	B_2	PP	C	D	B_6
a. For healthy people not engaged in physical labor.	3,000-3,200	100-110	100	400-450	1	2	2	15	50	0.025	2

	Large calorie quantity	Proteins	Fats (in grams)	Carbo-hydrates	Vitamins (in milligrams) A	B_1	B_2	PP	C	D	B_6
b. For atherosclerotic patients under hospital conditions	2,700	110	65	400	1	2	2	15	150	0.01	4
c. For atherosclerotic patients inclined to obesity	2,200	100	60	300	1	2	2	15	150	0.01	2
For myocardial infarct patients:											
d. First two days of illness	600-700	30	10	100	1	1-2	1-2	10	100	-	2
e. On 3rd and 4th days	1,000	60	20	140	1	2	2	10	100	0.01	3
f. On the 7th day	1,365-1,400	65	30	200	1	2	2	15	100	0.01	4
g. On the 21st day	1,600	80	40	240	1	2	2	15	100	0.01	4
h. On the 45th day	2,000-2,200	100	50	300	1	2	2	15	100-150	0.01	4

	sodium chloride	calcium	phosphorous	magnesium	iron	method of preparation
			(in grams)			
a.	12-15	0.8	1.4	0.5	15	usual
b.	6-7	0.8	1.4	0.8 - 1.0	15	usual, with limited salt and extractives
c.	5-6	0.8	1.4	0.8	10	With limited salt and extractives

	sodium chloride	calcium	phosphorous	magnesium	iron	method of preparation
			(in grams)			
d.	1-2	0.5	1-1.2	0.5	10	Without salt and extractives
e.	2	0.5	1-1.2	0.5	10	"
f.	2	0.8	1.4	1	15	"
g.	3-4	0.8	1.4	1	15	"
h.	5-6	0.8	1.5	1	15	Without extractives

	Frequency of intake [per day]	Amount of liquid (in liters)	Cholesterol (in milligrams)
a.	4	2.5	3,000
b.	5	2.5	1,000
c.	5	2.5	500
d.	7-8	1.2-1.5	-
e.	7-8	1.2-1.5	125
f.	6	1.5	160
g.	6	1.5	260
h.	6	2	900

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